

CLAIMS

1. A device comprising:

an outer portion comprising an electrically insulative material, having dimensions effective to prevent or inhibit plasma arcing to an electrically conductive surface of a plasma processing chamber aperture, and

an inner opening, completely surrounded by the electrically insulative material of the outer portion, having dimensions effective to enable transmission of a physical signal or a gas, gas mixture or other material through the device.

2. A plasma processing chamber having:

at least one aperture therein, the at least one aperture having an exposed electrically conductive surface, and

the device of Claim 1, located inside the aperture.

3. A method of making a plasma processing chamber, the

chamber having at least one aperture therein, the at least one aperture having an exposed electrically conductive surface, the method comprising inserting the device of Claim 1 into the aperture.

4. A method of processing a workpiece, comprising the following steps:

(A) exposing the workpiece to a plasma in the chamber of Claim 2; and

5 (B) transmitting a physical signal or a gas, gas mixture or other material through the device into or out from the chamber.

5. A plasma processing chamber having:

at least one aperture therein, the at least one aperture having an exposed electrically conductive surface, and

a device inside the aperture, the device comprising an electrically insulative material and having

(i) dimensions effective to prevent or inhibit plasma arcing to the exposed electrically conductive surface of the aperture; and

(ii) an inner opening completely surrounded by the electrically insulative material, the inner opening having dimensions effective to enable transmission of a physical signal or a gas, gas mixture or other material through the device.

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6. A method of making a plasma processing chamber, the chamber having at least one aperture therein, the at least one aperture having an exposed electrically conductive surface, the method comprising inserting a device into the aperture, the device comprising an electrically insulative material and having:

5 dimensions effective to prevent or inhibit plasma arcing to the exposed electrically conductive surface of the aperture, and an inner opening completely surrounded by the electrically insulative material, the inner opening having dimensions effective to enable transmission of a physical signal or a gas, gas mixture or other material through the device.

7. The method of Claim 6, further comprising, prior to said inserting, the step of forming said aperture in said chamber.

8. A method of processing a workpiece, comprising:  
exposing the workpiece to a plasma in a chamber, the chamber having at least one aperture therein, the at least one aperture having

5 1) an exposed electrically conductive surface; and

2) a device in the aperture, the device comprising an electrically insulative material and having

(i) dimensions effective to prevent or inhibit plasma arcing to the exposed electrically conductive surface of the

10 aperture; and

(ii) an inner opening completely surrounded by the electrically insulative material, the inner opening having dimensions effective to enable transmission of a physical signal or a gas, gas mixture or other material through the device; and

(iii) transmitting a physical signal or a gas, gas mixture or other material through the device into or out from the chamber.

9. A method of operating a plasma processing chamber, wherein the chamber has at least one aperture therein and the aperture has an exposed electrically conductive surface, the method comprising the steps of:

5 (A) initiating a plasma in the chamber, the aperture having the device of Claim 1 therein, then

(B) cleaning the chamber and the device.

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10. The method of Claim 9, wherein said plasma exists in said chamber for a predetermined period of time.

11. The method of Claim 9, further comprising, prior to said inserting, the steps of:

exposing a workpiece to the plasma, and

transmitting a physical signal or a gas, gas mixture or other material through the device into or out from the chamber.

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